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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/564,015	05/12/2006	Shinji Shimosaki	0149-053929	4101

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EXAMINER	
SMITH, FRANCIS P	
ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/564,015	SHIMOSAKI ET AL.	
	Examiner	Art Unit	
	Francis P. Smith	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 9, 2009 has been entered.

Response to Arguments

2. Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection. Claim 2 is canceled, claims 1, 3, and 4 are currently amended. Claims 1 and 3-8 are currently pending and examined on the merits.

Claim Rejections - 35 USC § 102/103

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 5, and 8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kalbskopf et al. (US 4,294,868).

Kalbskopf teaches a process for continuously depositing a layer of a solid material on the surface of a substrate. Specifically, Kalbskopf teaches vapor depositing a hydrolysable metal compound and water vapor onto a substrate to form a film of a metal oxide precursor on the surface of said substrate, wherein in the vapor deposition step, the hydrolysable metal compound vapor and the water vapor which are reacting with one another are previously mixed and the mixed vapors are brought into contact with the substrate in the immediate proximity of the surface of said substrate. The vapor deposition step is carried out by injection of jetted streams of the hydrolysable metal compound vapor and water vapor toward the substrate which is continuously moving, and the mixing is performed by injecting the hydrolysable metal compound vapor and the water vapor in such a manner that the resulting two jetted vapor streams meet each other before they reach the substrate (col. 6, lines 26-51). Regarding the calcination step in an oxidizing atmosphere, it is noted that Kalbskopf teaches heating the substrate for deposition (col. 8, lines 28-36). Therefore, given that water vapor is expelled from jet ducts 3 and 4 (fig. 2), the precursors are converted into a metal oxide once contacting the heated substrate (e.g. calcination in an oxidizing atmosphere). Regarding the limitation that the previously mixed vapors are brought into contact with the substrate within 3 seconds after mixing, Kalbskopf teaches that the jetted hydrolysable metal and water vapor precursors converge toward a common line (e.g. previously mixed vapors) such that the combined flow of these precursors takes place only in the **immediate proximity of the surface of the substrate, whereby the combining reaction occurs on the glass** (col. 6, lines 37-63). Thus, given that the

combination of precursors takes place in the immediate proximity of the substrates surface such that the combining reaction occurs on the glass, the mixed vapors are inherently brought into contact with the substrate within 3 seconds after mixing.

In case the 3 sec limitation is not clearly envisaged, one having ordinary skill in the art at the time of the invention still would reasonably expect that the mixed vapors are brought into contact with the substrate within 3 seconds after mixing in order to avoid the precipitation of white oxide precipitates that clog the jet ducts (col. 6, lines 54-63) and because Kalbskopf discloses that the jetted hydrolysable metal and water vapor precursors converge toward a common line (e.g. previously mixed vapors) such that the combined flow of these precursors takes place only in the immediate proximity of the surface of the substrate, whereby the combining reaction occurs on the glass (col. 6, lines 37-63).

Regarding claim 4, it is noted that processing parameters, such as the angle size with respect to each nozzle and the water vapor flow rate, are result effective. The instant application lacks notification of criticality of a specific angle of a water vapor slit nozzle and a hydrolysable metal compound vapor nozzle, or of a specific hydrolysable metal compound vapor flow rate. The angle of the nozzles will affect the surface area of the substrate to be coated. A larger angle will allow for more coating coverage on the substrate. Regarding the flow rate, the jet velocity will cool the substrate in the coating zone. Too great of a flow rate will cool the substrate substantially and affect deposited film uniformity. Furthermore, the discovery of optimum values of result effective variables in known processes would have been obvious to a person of ordinary skill in

the art at the time of the invention in the absence of unexpected results. Consult *In re Boesch and Slaney (205 USPQ 215 (CCPA 1980))*.

For claim 5, Kalbskopf teaches the hydrolysable metal compound is a metal chloride (col. 4, line 44).

As per claim 8, Kalbskopf teaches substantially the same metal oxide film, and thus, would inherently function the same as the film of the instant application (col. 8, lines 17-26).

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kalbskopf et al. (US 4,294,868) as applied to claim 1 above, and further in view of Tanaka et al. (US 2002/0106321 A1) and Lindner et al. (WO 89/00549).

As per claim 3, Kalbskopf teaches injecting water vapor through slit nozzles (col. 3, lines 51-60); however, Kalbskopf does not expressly teach the hydrolysable metal compound vapor is injected in a reverse direction with respect to the direction of the movement of the substrate through a multi-orifice nozzle.

Tanaka teaches a process for forming titanium dioxide whereby the metal compound vapor is deposited through a coaxial flow nozzle (i.e. multi-orifice nozzle) in order create turbulence, thus promoting reactant mixing (Tanaka [0051]). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to utilize a multi-orifice nozzle in Kalbskopf as taught by Tanaka in order to promote the mixing of reactants. However, Kalbskopf/Tanaka does not teach injecting the vapors in a reverse direction with respect to the direction of movement of the

substrate.

Lindner teaches a coating applicator system and deposition method for chemical vapor deposition of a metal-containing film on a surface of a substrate. Specifically, the coating applicator contains nozzles arranged in opposing relation to and toward each other at an angle of approximately 30-70 degrees with respect to normal and contain slits of about 5mm (e.g. slit nozzle) (page 9 , lines 30-34; page 18, lines 14-17). A glass substrate may be moved with respect to stationary nozzles 10a and 10b, and thus, a metal compound vapor is injected in a reverse direction with respect to the direction of the movement of the substrate and nozzle 10a (page. 13, lines 1-5; see figure 17). Furthermore, the angle between the nozzle and the surface of the substrate is adjustable (page 15, lines 21-27). Therefore, it would have been obvious to one skilled in the art at the time of the invention to utilize Lindner's reverse deposition technique in Kalbskopf/Tanaka's method in order to deposit a metal oxide coating while maintaining high jet velocities capable of coating the desirable areas of interest on the moving substrate.

9. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalbskopf et al. (US 4,294,868) as applied to claim 5 above, and further in view of Novak et al. (US 4,261,722).

For claim 6, Kalbskopf teaches utilizing titanium chloride as the metal chloride and a calcination temperature of about 600°C (col. 8, lines 17-30). However, Kalbskopf does not teach of substrate temperatures in the vapor deposition step of 150-250°C.

Novak teaches a method for applying an inorganic coating to a glass surface utilizing titanium chloride and water vapor whereby the temperature of the substrate may be in the range of 150-700°C to avoid iridescent coatings associated with high temperature substrates (col. 5, lines 1-12). Therefore, it would have been obvious to one skilled in the art at the time of the invention to utilize Novak's substrate temperatures in Kalbskopf's method in order to successfully form an inorganic metal coating on a heated substrate, while avoiding the formation of thick iridescent coatings that result from excessively high substrate temperatures.

As for claim 7, Kalbskopf/Novak does not specify a particular $TiCl_4/H_20$ ratio. Generally, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. However, it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hatano et al. (US 5,919,726) teaches a substantially similar process whereby a substrate containing a metal oxide precursor is annealed in an oxygen environment to yield the titanium oxide layer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/F. P. S./
Examiner, Art Unit 1792